




May 20th, 12:15 PM - 12:45 PM

Wilson-Cowan coupled dynamics in a model of the cortico-striato-thalamo-cortical circuit

Anca R. Radulescu

State University of New York at New Paltz, radulesa@newpaltz.edu

Follow this and additional works at: <http://scholarscompass.vcu.edu/bamm>

 Part of the [Computational Neuroscience Commons](#), [Dynamical Systems Commons](#), [Non-linear Dynamics Commons](#), [Ordinary Differential Equations and Applied Dynamics Commons](#), and the [Systems Neuroscience Commons](#)

<http://scholarscompass.vcu.edu/bamm/2016/May20/8>

This Event is brought to you for free and open access by the Dept. of Mathematics and Applied Mathematics at VCU Scholars Compass. It has been accepted for inclusion in Biology and Medicine Through Mathematics Conference by an authorized administrator of VCU Scholars Compass. For more information, please contact libcompass@vcu.edu.

Wilson-Cowan coupled dynamics in a model of the cortico-striato-thalamo-cortical circuit

Anca Rădulescu, Department of Mathematics, SUNY New Paltz, *radulesa@newpaltz.edu*

Abstract

The neuronal circuit that controls the execution of stereotyped behaviors involves three major regions of the brain: the cortex, the striatum and the thalamus (the CSTC pathway). Coordinated interplay between activation and inhibition within the CSTC pathway is crucial for proper thought-processing and movement execution. However, there is no clear understanding of basic mechanisms generating hyperactivity in the CSTC pathway – a hallmark feature of patients with increased anxiety and motor activity, like the ones affected by obsessive compulsive disorder.

We build a coupled nonlinear model of neural and synaptic activity, that captures salient information in the CSTC circuit provided by electrode recordings and optogenetic studies in rodents. Using methods from nonlinear dynamics and bifurcation theory, we study the system's temporal behavior and its dependence on parameters. We verify and interpret current molecular theories on the role of CSTC regulation in the formation of obsessions and compulsions.